Claims

1. Method for testing the time delay error ratio ER of a device against a maximal allowable time delay error ratio ER_{limit} with an early pass criterion, whereby the early pass criterion is allowed to be wrong only by a small probability D_1, with the following steps

- measuring ns time delays (TD) of the device, thereby detecting ne bad time delays, which exceed a certain time limit, of these ns time delays (TD),

- assuming that the likelihood distribution giving the distribution of the number ni of bad time delays in a fixed number of samples of time delays (TD) is PD(ni,NE), wherein NE is the average number of bad time delays, obtaining PD_{high} from

$$D_1 = \int_0^{ne} PD_{high}(ni, NE_{high})\, dni$$

wherein PD_{high} is the worst possible likelihood distribution containing the measured ne bad time delays with the probability D_1,

- obtaining the average number NE_{high} of bad time delays for the worst possible likelihood distribution PD_{high},

- comparing NE_{high} with $NE_{limit} = ER_{limit} \cdot ns$,

- if NE_{limit} is higher than NE_{high} stopping the test and deciding that the device has early passed the test and

- if NE_{limit} is smaller than NE_{high} continuing the test whereby increasing ns.

2. Method for testing the time delay error ratio ER of a device against a maximal allowable time delay error ratio ER_{limit} with an early pass criterion, whereby the early pass criterion is allowed to be wrong only by a small probability F_1 for the entire test, with the following steps

- measuring ns time delays (TD) of the device, thereby

detecting ne bad time delays, which exceed a certain time limit, of these ns time delays (TD)

- assuming that the likelihood distribution giving the distribution of the number ni of bad time delays in a fixed number of samples of time delays (TD) is PD(ni,NE), wherein NE is the average number of bad time delays, obtaining PD_{high} from

$$D_1 = \int_0^{ne} PD_{high}(ni, NE_{high})\,dni$$

wherein PD_{high} is the worst possible likelihood distribution containing the measured ne bad time delays with a single step wrong decision probability D_1 for a preliminary error ratio ER stage, whereby using a single step wrong decision probability D_1 smaller than the probability F_1 for the entire test,

- obtaining the average number of NE_{high} of bad time delays for the worst possible likelihood distribution PD_{high},

- comparing NE_{high} with $NE_{limit} = ER_{limit} \cdot ns$,

- if NE_{limit} is higher than NE_{high} stopping the test and deciding that the device has early passed the test and

- if NE_{limit} is smaller than NE_{high} continuing the test whereby increasing ns.

3. Method according to claim 1,
characterized in that
the single step wrong decision probability D_1 is in the range of

$$F_1 > D_1 \geq 1-(1-F_1)^{1/ne}.$$

4. Method according to any of claims 1 to 3,
characterized in that
the likelihood distribution PD_{high}(ni,NE) is the Poisson distribution.

5. Method according to any of claims 1 to 3,
characterized in that

the likelihood distribution $PD_{high}(ni,NE)$ is the binomial distribution.

6. Method according to any of claims 1 to 5, **characterized in that** for avoiding an undefined situation for ne=0 starting the test with an artificial bad time delay ne=1, not incrementing ne then a first error occurs.

7. Method for testing the time delay error ratio ER of a device against a maximal allowable time delay error ratio ER_{limit} with an early fail criterion, whereby the early fail criterion is allowed to be wrong only by a small probability D_2, with the following steps

- measuring ns time delays (TD) of the device, thereby detecting ne bad time delays, which exceed a certain time limit, of these ns time delays (TD),
- assuming that the likelihood distribution giving the distribution of the number ni of bad time delays in a fixed number of samples of time delays (TD) is PD(ni,NE), wherein NE is the average number of bad time delays, obtaining PD_{low} from the

$$D_2 = \int_{ne}^{\infty} PD_{low}(ni, NE_{low})\,dni$$

wherein PD_{low} is the best possible likelihood distribution containing the measured ne bad time delays with the probability D_2,

- obtaining the average number NE_{low} bad time delays for the best possible likelihood distribution PD_{low},
- comparing NE_{low} with $NE_{limit} = ER_{limit} \cdot ns$,
- if NE_{limit} is smaller than NE_{low} stopping the test and deciding that the device has early failed the test and
- if NE_{limit} is higher than NE_{low} continuing the test whereby increasing ns.

8. Method for testing the time delay error ratio ER of a device against a maximal allowable time delay error ratio

ER_{limit} with an early fail criterion, whereby the early fail criterion is allowed to be wrong only by a small probability F_2 for the entire test, with the following steps

- measuring ns time delays (TD) of the device, thereby detecting ne bad time delays, which exceed a certain time limit, of these ns time delays (TD),

- assuming that the likelihood distribution giving the distribution of the number ni of bad time delays in a fixed number of samples of time delays (TD) is PD(ni,NE), wherein NE is the average number of bad time delays, obtaining PD_{low} from

$$D_2 = \int_{ne}^{\infty} PD_{low}(ni, NE_{low})dni$$

wherein PD_{low} is the best possible likelihood distribution containing the measured ne bad time delays with a single step wrong decision probability D_2 for a preliminary error ratio ER stage, whereby using a single step wrong decision probability D_2 smaller than the probability F_2 for the entire test,

- obtaining the average number NE_{low} bad time delays for the best possible likelihood distribution PD_{low},

- comparing NE_{low} with $NE_{limit} = ER_{limit} \cdot ns$,

- if NE_{limit} is smaller than NE_{low} stopping the test and deciding that the device has early failed the test and

- if NE_{limit} is higher than NE_{low} continuing the test whereby increasing ns.

9. Method according to claim 8,
characterized in that
the single step wrong decision probability D_2 is in the range of

$$F_2 > D_2 \geq 1-(1-F_2)^{1/ne} .$$

10. Method according to any of claims 7 to 9,
characterized in that
the likelihood distribution PD_{low}(ni,NE) is the Poisson

distribution.

11. Method according to any of claims 7 to 9, **characterized in that** the likelihood distribution $PD_{low}(ni,NE)$ is the binomial distribution.

12. Method according to any of claims 7 to 11, **characterized in that** for avoiding a undefined situation for ne<k, wherein k is a small number of bad time delays, not stopping the test as long as ne is smaller than k.

13. Method according to any of claims 7 to 12, **characterized by** an additional early pass criterion, whereby the early pass criterion is allowed to be wrong only by a small probability D_1, with the following additional steps

- assuming that the likelihood distribution giving the distribution of the number of bad time delays ni in a fixed number of samples of time delays (TD) is PD(ni,NE), wherein NE is the average number of bad time delays, obtaining PD_{high} from

$$D_1 = \int_0^{ne} PD_{high}(ni, NE_{high})dni$$

wherein PD_{high} is the worst possible likelihood distribution containing the measured ne bad time delays with the probability D_1,

- obtaining the average number NE_{high} of bad time delays for the worst possible likelihood distribution PD_{high},
- comparing NE_{high} with $NE_{limit} = ER_{limit} \cdot ns$,
- if NE_{limit} is higher than NE_{high} stopping the test and deciding that the device has early passed the test and
- if NE_{limit} is smaller than NE_{high} continuing the test, whereby increasing ns.

14. Method according to any of claims 7 to 12,

characterized by

an additional early pass criterion, whereby the early pass criterion is allowed to be wrong only by a small probability D_1, with the following additional steps

- assuming that the likelihood distribution giving the distribution of the number of bad time delays ni in a fixed number of samples of time delays (TD) is PD(ni,NE), wherein NE is the average number of bad time delays, obtaining PD_{high} from

$$D_1 = \int_0^{ne} PD_{high}(ni, NE_{high})dni$$

wherein PD_{high} is the worst possible likelihood distribution containing the measured ne bad time delays with the probability D_1,

- obtaining the average number NE_{high} of bad time delays for the worst possible likelihood distribution PD_{high},
- comparing NE_{high} with $NE_{limit,M} = ER_{limit} \cdot M \cdot ns$, with $M > 1$,
- if $NE_{limit,M}$ is higher than NE_{high} stopping the test and deciding that the device has early passed the test and
- if $NE_{limit,M}$ is smaller than NE_{high} continuing the test, whereby increasing ns.

15. Method according to claim 13 or 14,

characterized in that

the probability D_1 for the wrong early pass criterion and the probability D_2 for the wrong early fail criterion are equal (D_1=D_2).

16. Method according to any of claims 7 to 12,

characterized by

an additional early pass criterion, whereby the early pass criterion is allowed to be wrong only by a small probability F_1 for the entire test, with the following additional steps

- assuming that the likelihood distribution giving the distribution of the number ni of bad time delays in a

fixed number of samples of time delays (TD) is PD(ni,NE), wherein NE is the average number of bad time delays, obtaining PD_{high} from

$$D_1 = \int_0^{ne} PD_{high}(ni, NE_{high})dni$$

wherein PD_{high} is the worst possible likelihood distribution containing the measured ne bad time delays with the single step wrong decision probability D_1 for a preliminary error ratio ER stage, whereby using a single step wrong decision probability D_1 smaller than the probability F_1 for the entire test,

- obtaining the average number of NE_{high} bad time delays for the worst possible likelihood distribution PD_{high},
- comparing NE_{high} with $NE_{limit} = ER_{limit} \cdot ns$,
- if NE_{limit} is higher than NE_{high} stopping the test and deciding that the device has early passed the test and
- if NE_{limit} is smaller than NE_{high} continuing the test, whereby increasing ns.

17. Method according to any of claims 7 to 12,
characterized by
an additional early pass criterion, whereby the early pass criterion is allowed to be wrong only by a small probability F_1 for the entire test, with the following additional steps

- assuming that the likelihood distribution giving the distribution of the number ni of bad time delays in a fixed number of samples of time delays (TD) is PD(ni,NE), wherein NE is the average number of bad time limits, obtaining PD_{high} from

$$D_1 = \int_0^{ne} PD_{high}(ni, NE_{high})dni$$

wherein PD_{high} is the worst possible likelihood distribution containing the measured ne bad time delays with the single step wrong decision probability D_1 for a

preliminary error ratio ER stage, whereby using a single step wrong decision probability D_1 smaller than the probability F_1 for the entire test,

- obtaining the average number NE_{high} of bad time delays for the worst possible likelihood distribution PD_{high},
- comparing NE_{high} with $NE_{limit,M} = ER_{limit} \cdot M \cdot ns$, with $M > 1$
- if $NE_{limit,M}$ is higher than NE_{high} stopping the test and deciding that the device has early passed the test and
- if $NE_{limit,M}$ is smaller than NE_{high} continuing the test, whereby increasing ns.

18. Method according to claim 16 or 17,
characterized in that
the probability F_1 for the wrong early pass criterion and the probability F_2 for the wrong early fail criterion are equal ($F_1=F_2$).

19. Method according to any of claims 7 to 18,
characterized in that
for avoiding a undefined situation for ne=0 starting the test with an artificial bad time delay ne=1 not incrementing ne then a first error occurs.

20. Digital storage medium with control signals electronically readable from the digital storage medium, which interact with a programmable computer or digital signal processor in a manner that all steps of the method according to any of claims 1 to 19 can be performed.

21. Computer-program-product with program-code-means stored on a machinereadable data carrier to perform all steps of any of claims 1 to 19, when the program is performed on a programmable computer or a digital signal processor.

22. Computer program with program-code-means to perform all steps of any of claims 1 to 19, when the program is performed on a programmable computer or a digital signal

processor.

23. Computer program with program-code-means to perform all steps of any of claims 1 to 19 when the program is stored on a machinereadable data carrier.